

PATENT COOPERATION TREATY

2

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

FUKAMI, Hisao
Mitsui Sumitomo Bank
Minamimorimachi Building
1-29, Minamimorimachi 2-chome
Kita-ku, Osaka-shi
Osaka 530-0054
JAPON

Date of mailing (day/month/year) 03 July 2001 (03.07.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 900332	
International application No. PCT/JP00/06114	International filing date (day/month/year) 07 September 2000 (07.09.00)

1. The following indications appeared on record concerning:			
<input type="checkbox"/> the applicant	<input type="checkbox"/> the inventor	<input checked="" type="checkbox"/> the agent	<input type="checkbox"/> the common representative
Name and Address 1) FUKAMI, Hisao 2) MORITA, Toshio 3) HORII, Yutaka Sumitomo Bank Minamimori-machi Building 1-29, Minamimori-machi 2-chome Kita-ku, Osaka-shi Osaka 530-0054 Japan		State of Nationality	State of Residence
		Telephone No. 06-6361-2021	
		Facsimile No. 06-6361-1731	
		Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:			
<input type="checkbox"/> the person	<input type="checkbox"/> the name	<input checked="" type="checkbox"/> the address	<input type="checkbox"/> the nationality <input type="checkbox"/> the residence
Name and Address Mitsui Sumitomo Bank Minamimorimachi Building 1-29, Minamimorimachi 2-chome Kita-ku, Osaka-shi Osaka 530-0054 Japan		State of Nationality	State of Residence
		Telephone No.	
		Facsimile No.	
		Teleprinter No.	
3. Further observations, if necessary:			
4. A copy of this notification has been sent to:			
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned		
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned		
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Masashi HONDA Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing: 22 March 2001 (22.03.01)	
International application No.: PCT/JP00/06114	Applicant's or agent's file reference: 900332
International filing date: 07 September 2000 (07.09.00)	Priority date: 14 September 1999 (14.09.99)
Applicant: NISHIMURA, Takashi et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:
01 February 2001 (01.02.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

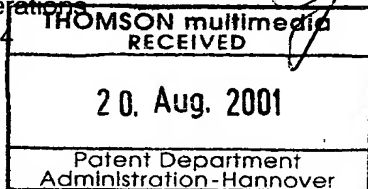
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer: J. Zahra Telephone No.: (41-22) 338.83.38
---	---

2.1. PATENT COOPERATION TREATY
EXPRESS EL90232413US

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

SCHÄFERJOHANN, Volker
DEUTSCHE THOMSON-BRANDT GMBH
European Patent Operations
Karl-Wiechert-Allee 74
D-30625 Hannover
ALLEMAGNE



PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 17.08.2001

Applicant's or agent's file reference
PD990053 ✓

IMPORTANT NOTIFICATION

International application No.
PCT/EP00/08064

International filing date (day/month/year)
18/08/2000

Priority date (day/month/year)
30/08/1999

Applicant
DEUTSCHE THOMSON-BRANDT GMBH

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Camps i Amigo, M.E.

Tel.+49 89 2399-2237



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PD990053	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/08064	International filing date (day/month/year) 18/08/2000	Priority date (day/month/year) 30/08/1999
International Patent Classification (IPC) or national classification and IPC H03L7/091		
Applicant DEUTSCHE THOMSON-BRANDT GMBH		



1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 01/03/2001	Date of completion of this report 17.08.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Kahn, K-D Telephone No. +49 89 2399 2253 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/08064

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-13 as originally filed

Claims, No.:

1-10 as received on 03/08/2001 with letter of 01/08/2001

Drawings, sheets:

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/08064

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1 - 10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1 - 10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1 - 10
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/08064

Concerning item V.:

1. The invention relates to a phase detector for a phase-locked loop, and therefore is applied in telecommunication industry.
2. The nearest prior art is D1: US-A-5 452 326. D1 discloses a phase detector according to the preamble of claim 1, in which samples of the input signal are taken and delayed and undelayed samples are subtracted from each other. A ROM assigns one well-defined output value to each possible differential input value.
3. The subject-matter of claim 1 is characterised over D1 by the feature that a value of "-1" is assigned to all negative differential input values, a value of "+1" is assigned to all positive differential input values, and a value of "0" is assigned to a zero differential input value.
4. These features solve the problem of providing faster acquisition due to the elimination of fine and low differential input values.
5. This is not disclosed or suggested by any of the citations.
6. The subject matter of independent claim 1 is new, inventive and is industrially applicable, and therefore fulfils the requirements of Article 33 PCT.
7. Dependent claims 2 - 10 contain modifications of the inventive idea embodied in claim 1. These claims also meet the requirements of Article 33 PCT.

Concerning item VII.:

1. To meet the requirements of Rule 5.1 (a) (ii) and (iii) PCT, the introductory part of the description should have been amended to include a reference to the documents D1 - D4 and their disclosure and should have been made consistent with the new claims.
2. The number of the prior art document identified on page 1, line 16 appears to be incorrect and should have been corrected.

Claims

REPLACED BY
ART 34 AMDT

1. Phase detector for a phase-locked loop, said phase detector having a sampled and digitized data signal supplied to it, having a delay stage (52) for delaying the data signal by one or more sampling clock periods, having a subtraction stage (53), to which the undelayed and the delayed data signal are supplied, characterized in that a processing stage (54) is provided which assigns one of a plurality of possible values, particularly +1, -1, 0, to the respective differential value depending on the value range in which the differential value is situated, and in that the assigned values are supplied to a filter/control stage (60), particularly a PI controller, at whose output the phase error can be tapped off.

2. Phase detector for a phase-locked loop, said phase detector having a sampled and digitized data signal supplied to it, having a delay stage (52) for delaying the data signal by one or more sampling clock periods, characterized in that a comparison stage is provided which compares a delayed sample with an undelayed sample and assigns one defined value from a plurality of possible values, particularly +1, -1, 0, to the respective comparison result, and in that the assigned values are supplied to a filter/control stage (60), particularly a PI controller, at whose output the phase error can be tapped off.

3. Phase detector according to Claim 1, in which the delayed digital sample is deducted from the undelayed digital sample in the subtraction stage (53) in each case.

4. Phase detector according to one of Claims 1-3, in which a rectifier (51) for signal conditioning is provided which has the sampled and digitized data signal

supplied to it, the data signal being a ternary data signal, in particular.

5. Phase detector according to Claim 4, in which the
5 sampled and digitized ternary data signal is supplied, before rectification, to a separating stage (55) in which the data signal is separated into a positive and a negative path.

10 6. Phase detector according to Claim 5, in which separate delay, subtraction and processing stages (52, 53, 54) or delay (52) and comparison stages are provided for each path, and in which an addition stage (56) is
15 provided in which the assigned output values from the processing (54) or comparison stages are added and, combined in this way, are passed on to the integration or control stage (60).

20 7. Phase detector according to Claim 6, in which, in addition to the separate delay, subtraction and processing stages (52, 53, 54) or delay (52) and comparison stages for the positive and the negative path, there are also separate delay, subtraction and processing
25 stages (52, 53, 54) or delay (52) and comparison stages for a further path, in which the complete data signal, including the positive and the negative path, is processed, the output values assigned by the processing stages (54) or comparison stages likewise being supplied
30 to the addition stage (56).

8. Use of the phase detector according to one of Claims 1-7 in a phase-locked loop to recover the data clock signal for a digital signal.

35 9. Use according to Claim 8, the sampling clock signal for sampling the data signal corresponding to the data clock signal in the data signal.

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 March 2001 (08.03.2001)

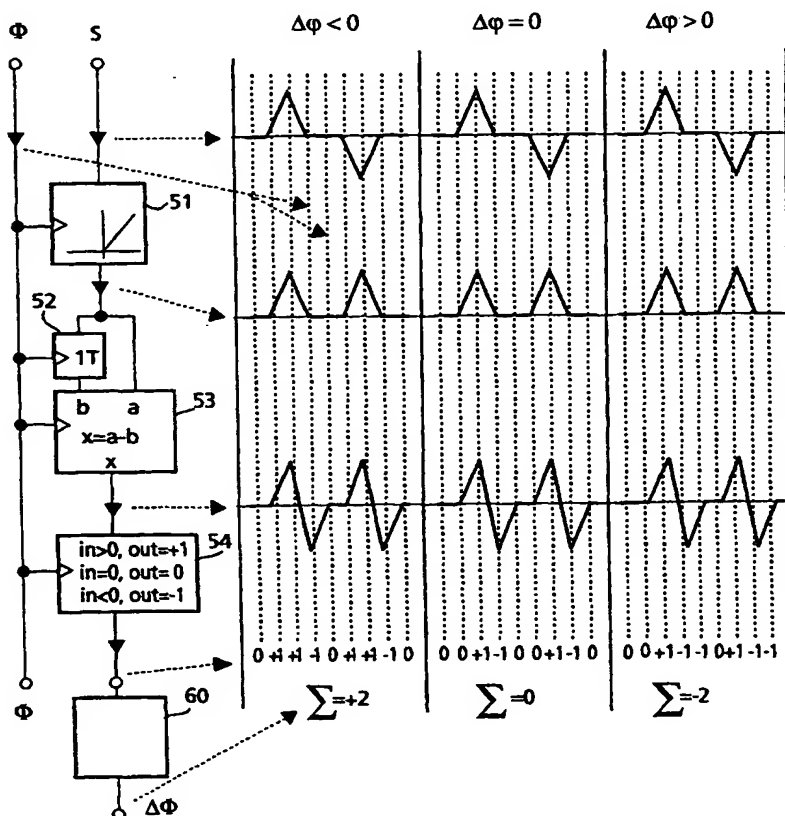
PCT

(10) International Publication Number
WO 01/17114 A1

- (51) International Patent Classification⁷: **H03L 7/091, G11B 20/14**
- (21) International Application Number: **PCT/EP00/08064**
- (22) International Filing Date: **18 August 2000 (18.08.2000)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
199 41 445.9 30 August 1999 (30.08.1999) DE
- (71) Applicant (for all designated States except US): **DEUTSCHE THOMSON-BRANDT GMBH [DE/DE]; Hermann-Schwer-Strasse 3, 78048 Villingen-Schwenningen (DE).**
- (72) Inventor; and
(75) Inventor/Applicant (for US only): **WURSTHORN, Edgar [DE/DE]; Friedrichstrasse 44/1, 78073 Bad Dürheim (DE).**
- (74) Agent: **SCHÄFERJOHANN, Volker; Deutsche Thomson-Brandt GmbH, European Patent Operations, Karl-Wiechert-Allee 74, 30625 Hannover (DE).**
- (81) Designated States (national): **AE, AG, AL, AU, BA, BB, BG, BR, CA, CN, CR, CU, CZ, DM, DZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LV, MA, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, TR, TT, UA, US, UZ, VN, YU, ZA.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,**

[Continued on next page]

(54) Title: **PHASE DETECTOR FOR A PHASE-LOCKED LOOP**



(57) Abstract: The invention proposes a phase detector (90) for a phase-locked loop. In this context, it relates to an improvement in the phase detector (90) which can be used in a digital PLL circuit. The invention consists in a sampled and digitized data signal being supplied to the phase detector (90) as an input signal. This data signal is delayed by a sampling clock signal in a delay stage (52). The delayed data signal and the undelayed data signal are then supplied to a subtraction stage (53). The difference between the two input values is formed in this subtraction stage. The differential value determined is then analysed in a processing stage (54) and one of a plurality of possible values is assigned to it. This is done on the basis of the value range in which the differential value is situated. The assigned value is then passed on as an output value to a filter/control stage (60), at whose output a phase error can then be tapped off. The solution described can be integrated very easily on a chip and affords a very advantageous response for the PLL control.

WO 01/17114 A1



IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

- *With international search report.*
- *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PD990053	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 08064	International filing date (day/month/year) 18/08/2000	(Earliest) Priority Date (day/month/year) 30/08/1999
Applicant DEUTSCHE THOMSON-BRANT GMBH		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/08064

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H03L7/091 G11B20/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03L G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 452 326 A (TANAKA MASATO) 19 September 1995 (1995-09-19) column 8, line 39 -column 9, line 60; figure 5 ---	1-3 4-9
X	US 5 027 085 A (DEVITO LAWRENCE M) 25 June 1991 (1991-06-25) abstract; figure 3 ---	1-3
X	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 06, 28 June 1996 (1996-06-28) & JP 08 031110 A (CANON INC), 2 February 1996 (1996-02-02) cited in the application abstract ---	1-3
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

19 December 2000

Date of mailing of the international search report

29/12/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Kahn, K-D

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/08064

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>EP 0 549 412 A (THOMSON CSF) 30 June 1993 (1993-06-30) page 2, line 51 -page 4, line 12 -----</p>	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/08064

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5452326	A	19-09-1995	JP 5235751 A	10-09-1993
US 5027085	A	25-06-1991	DE 69008861 D	16-06-1994
			DE 69008861 T	03-11-1994
			EP 0494984 A	22-07-1992
			JP 5501340 T	11-03-1993
			WO 9105422 A	18-04-1991
JP 08031110	A	02-02-1996	EP 0695089 A	31-01-1996
			US 6118606 A	12-09-2000
EP 0549412	A	30-06-1993	FR 2685518 A	25-06-1993
			DE 69222836 D	27-11-1997
			DE 69222836 T	12-03-1998
			JP 6162679 A	10-06-1994
			US 5986834 A	16-11-1999